PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-229010
(43)Date of publication of application : 14.08.2002

(51)Int.Cl. G02F 1/1335
G02F 1/1343
G09F 9/30

(21)Application number : 2001-029745
(22)Date of filing : 06.02.2001

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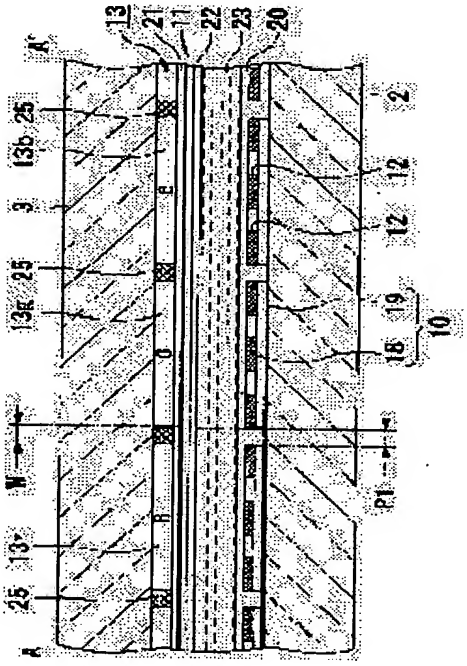
(54) LIQUID CRYSTAL DISPLAY AND ELECTRONIC DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a transflective color liquid crystal display which carries out bright display at reflection mode and surely display at transmission mode.
SOLUTION: The liquid crystal display is provided with segment electrodes 10 with laminated structure, consisting of an APC(Ag-Pd-Cu) pattern 18 and an ITO (indium tin oxide) pattern 19 on a lower substrate 2 and a common electrode 11, consisting of a color filter 13 with respective aligned pigment layers of R, G, B, 13r, 13g, 13b and an ITO film on an upper substrate 3. The segment electrodes 10 are provided with window parts 12 for light transmission, in which only the APC pattern is partly opened, in the respective pixels. The entire region on the lower surface of the APC pattern 18 is covered with the ITO pattern 19, and as a result, the ITO pattern 19 exists on the lower side of the window parts 12.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

[Date of extinction of right]

(19)日本国特許庁（ＪＰ）　(12)公開特許公報（Ａ）　(11)特許出願公開番号
特開2002－229010
（P2002－229010A）
(43)公開日　平成14年８月14日(2002.8.14)

(51)Int.Cl.'		識別記号	FI			テーマコード'(参考)
Ｇ０２Ｆ	1/1335	５０５	Ｇ０２Ｆ	1/1335	５０５	２Ｈ０９１
	1/1343			1/1343		２Ｈ０９２
Ｇ０９Ｆ	9/30	３３０	Ｇ０９Ｆ	9/30	３３０Ｚ	５Ｃ０９４
		３３６			３３６	
		３３８			３３８	

審査請求　未請求　請求項の数５　ＯＬ　（全９頁）　最終頁に続く

(21)出願番号　特願2001－29745(P2001－29745)

(22)出願日　平成13年２月６日(2001.2.6)

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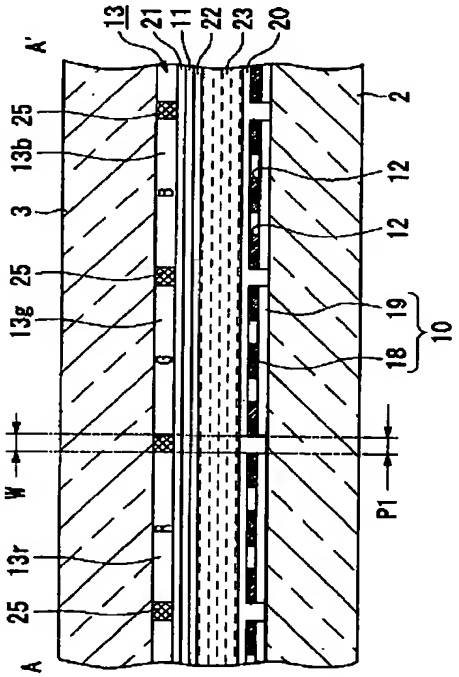
Ｆターム(参考)　2H091 FA02Y FA34Y FA41Z GA01 GA02 GA06
2H092 GA05 JA01 JB51 PA01 PA02 PA08 PA13
5C094 BA03 BA43 CA19 CA24 EA04 EA05 EA07 ED02

(54)【発明の名称】　液晶表示装置および電子機器

(57)【要約】
【課題】　反射モード時に明るい表示が可能であり、透過モード時にも確実に表示を行い得る半透過反射型カラー液晶表示装置を提供する。
【解決手段】　本発明の液晶表示装置は、下基板２上にＡＰＣパターン１８とＩＴＯパターン１９との積層構造を有するセグメント電極１０が設けられるとともに、上基板３上にはＲ、Ｇ、Ｂの各色素層１３ｒ，１３ｇ，１３ｂが配列されたカラーフィルター１３とＩＴＯ膜からなるコモン電極１１とが設けられている。前記セグメント電極１０はＡＰＣパターン１８のみが部分的に開口した光透過用の窓部１２を各画素内に有しており、ＡＰＣパターン１８の下面全域をＩＴＯパターン１９で覆ったことにより窓部１２の下方にはＩＴＯパターン１９が存在している。



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【特許請求の範囲】

【請求項１】　互いに対向配置された一対の基板間に液晶が挟持された液晶表示装置であって、

前記一対の基板のうち、一方の基板上に銀合金膜と透明導電膜との積層構造を有する複数の第１の電極が設けられるとともに、他方の基板上には異なる色の複数の色素層が配列されたカラーフィルターと透明導電膜からなる複数の第２の電極とが設けられ、前記第１の電極は、前記銀合金膜と前記透明導電膜のうち、銀合金膜が部分的に欠落した領域からなる光透過領域を各画素内に有するとともに、前記光透過領域を含む前記銀合金膜と前記透明導電膜のいずれか一方の膜の上面または下面の全域を他方の膜が覆っていることを特徴とする液晶表示装置。

【請求項２】　各画素内において前記第１の電極を構成する銀合金膜のパターンが窓状に開口し、該窓状に開口した部分が前記光透過領域となることを特徴とする請求項１に記載の液晶表示装置。

【請求項３】　各画素内において前記第１の電極を構成する銀合金膜のパターンの幅よりも透明導電膜のパターンの幅の方が大きく、前記透明導電膜の縁部が前記光透過領域となることを特徴とする請求項１または２に記載の液晶表示装置。

【請求項４】　前記複数の第１の電極がストライプ状に形成されたセグメント電極であり、前記複数の第２の電極が前記第１の電極と交差する方向にストライプ状に形成されたコモン電極であることを特徴とする請求項１ないし３のいずれか一項に記載の液晶表示装置。

【請求項５】　請求項１ないし４のいずれか一項に記載の液晶表示装置を備えたことを特徴とする電子機器。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、液晶表示装置および電子機器に関し、特に半透過反射型カラー液晶表示装置の構成に関するものである。

【０００２】

【従来の技術】反射型液晶表示装置はバックライト等の光源を持たないために消費電力が小さく、従来から種々の携帯電子機器や装置の付属的な表示部等に多用されている。ところが、自然光や照明光などの外光を利用して表示するため、暗い場所では表示を視認することが難しいという問題があった。そこで、明るい場所では通常の反射型液晶表示装置と同様に外光を利用するが、暗い場所では内部の光源により表示を視認可能にした形態の液晶表示装置が提案されている。つまり、この液晶表示装置は反射型と透過型を兼ね備えた表示方式を採用しており、周囲の明るさに応じて反射モード、透過モードのいずれかの表示方式に切り替えることにより消費電力を低減しつつ周囲が暗い場合でも明瞭な表示が行えるようにしたものである。以下、本明細書ではこの種の液晶表示装置のことを「半透過反射型液晶表示装置」という。

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【０００３】半透過反射型液晶表示装置の形態としては、半透過反射膜、いわゆるハーフミラーを備えたものが知られている。半透過反射膜は通常、反射膜として用いられるアルミニウム等の金属膜の膜厚を最適化することによって光をある程度透過すると同時にある程度反射するようにしたものである。しかしながら、半透過反射膜を形成するにはマスクスパッタ等の成膜技術が必要であり、工程が複雑化することに加えて、膜厚ばらつきが大きいために透過率、反射率のばらつきが大きくなる、といった欠点がある。

【０００４】そこで、上記半透過反射膜の欠点を克服するために、光透過用のスリットを形成した反射膜を備えた液晶表示装置が提案された。図１０はパッシブマトリクス方式の半透過反射型カラー液晶表示装置の一例を示している。この液晶表示装置１００では、一対の透明基板１０１，１０２間に液晶１０３が挟持されており、下基板１０１上に反射膜１０４、赤（Ｒ）、緑（Ｇ）、青（Ｂ）の異なる色の色素層１０５ｒ，１０５ｇ，１０５ｂからなるカラーフィルター１０５、オーバーコート膜１０６、シリコン酸化膜１０７が積層され、その上にインジウム錫酸化物（Indium Tin Oxide，以下、ＩＴＯと略記する）等の透明導電膜からなるストライプ状のセグメント電極１０８が形成されている。一方、上基板１０２上にはＩＴＯ等の透明導電膜からなるコモン電極１０９がセグメント電極１０８と直交する方向にストライプ状に形成されている。反射膜１０４はアルミニウムなどの反射率の高い金属膜で形成されており、各画素毎に光透過用のスリット１１０が形成されている。また、上下基板の外側には偏光板（図示略）が配置され、バックライト（図示略）が下基板の下面側に配置されている。

【０００５】上記構成の液晶表示装置１００を明るい場所で反射モードで使用する際には上基板１０２の上方から入射した外光が液晶１０３を透過して反射膜１０４の表面で反射した後、再度液晶１０３を透過し、上基板１０２側に出射される。暗い場所で透過モードで使用する際には下基板１０１の下方に設置したバックライトから出射される光がスリット１１０の部分で反射膜１０４を透過し、その後、液晶１０３を透過して上基板１０２側に出射される。これらの光が各モードでの表示に寄与する。

【０００６】

【発明が解決しようとする課題】ところで、半透過反射型液晶装置における反射膜には、アルミニウムなどの金属膜が従来から用いられてきたが、より明るい画面が求められており、近年、アルミニウムよりも反射率が高い銀・パラジウム・銅合金（Ａｇ－Ｐｄ－Ｃｕ、以下、本明細書ではＡＰＣと略記する）も用いられるようになっている。ところが、ＡＰＣは製造プロセス中において耐水性が弱いという性質を持っており、単独では使いにくいため、ＡＰＣの上層または下層にＩＴＯを積層した積

層膜として用いている。

【０００７】図９はＡＰＣとＩＴＯの積層膜からなる反射電極に光透過用のスリットを設けた半透過反射型カラー液晶表示装置の例を示している。この液晶表示装置９０では、一対の透明基板９１，９２間に液晶９３が挟持されており、下基板９１上に、スリット９４を有するＡＰＣ膜９５とＩＴＯ膜９６からなる積層構造のセグメント電極９７がストライプ状に形成され、その上に配向膜９８が形成されている。一方、上基板９２には、Ｒ、Ｇ、Ｂの色素層８９ｒ，８９ｇ，８９ｂからなるカラーフィルター８９、オーバーコート膜８８、ＩＴＯ膜からなるストライプ状のコモン電極８７、配向膜８６が順次形成されている。また、上下基板の外側には偏光板（図示略）が配置され、バックライト（図示略）が下基板９１の下面側に配置されている。この構成では、下基板９１上のＡＰＣ膜９５とＩＴＯ膜９６の積層膜が半透過反射層として機能すると同時に液晶駆動用の電極としても機能するので、下基板９１上にカラーフィルターを形成することができず、カラーフィルター８９は上基板９２上に形成されている。

【０００８】また、ＡＰＣは反射率が高いばかりでなく、ＩＴＯ等と比べて比抵抗が低いという特性も持っているため、電極・配線材料としても適している。特にＩＴＯと比べた場合、ＩＴＯの比抵抗が$2\times10^{-4}\Omega\cdot m$であるのに対し、ＡＰＣの比抵抗は$3.9\times10^{-6}\Omega\cdot m$であり、１／５０程度の値しかない。つまり、膜厚が同じだとすると同じ抵抗値を得るのにＡＰＣ配線はＩＴＯ配線の１／５０の配線幅で済む。そのため、電極ー駆動用半導体素子間の引き回し配線にＡＰＣを用いる図９の液晶表示装置では、引き回し配線にＩＴＯを用いる図１０の液晶表示装置に比べて引き回し配線の微細化が図れ、有効表示領域周辺の非表示領域（本明細書では以下、額縁領域とも言う）の面積を小さくする（狭額縁化する）ことができる。特に、狭額縁の液晶表示装置は、筐体内の限られた空間に収容することができ、かつ占有面積に対して表示し得る情報量が多くなることから、携帯電話等の携帯用小型電子機器に好適なものとなる。

【０００９】しかしながら、図９に示した従来の液晶表示装置には以下のような問題点があった。すなわち、ＡＰＣ膜９５とＩＴＯ膜９６の積層膜を半透過反射膜として機能させるために光透過用のスリット９４を設けた場合、スリット９４の形成領域はセグメント電極９７が局所的に存在しないため、スリット９４の直上の液晶に電界が印加されないことになる。すると、スリット９４の部分は光が透過しても液晶がオン、オフしないので、透過モードの表示ができなくなってしまう。例えばスリットの幅を３μｍ程度まで微細化すれば、横電界によってスリット９４上の液晶も駆動できるようになるが、このような微細なスリットを寸法精度良く形成するのは製造プロセス上困難である。

【００１０】本発明は、上記の課題を解決するためになされたものであり、ＡＰＣ等の銀合金膜とＩＴＯ等の透明導電膜との積層膜を半透過反射層兼電極として用いた液晶表示装置において、反射モード時に明るい表示が得られるとともに透過モード時の表示が確実に行える半透過反射型カラー液晶表示装置を提供することを目的とする。

【００１１】

【課題を解決するための手段】上記の目的を達成するために、本発明の液晶表示装置は、互いに対向配置された一対の基板間に液晶が挟持された液晶表示装置であって、一対の基板のうち、一方の基板上に銀合金膜と透明導電膜との積層構造を有する複数の第１の電極が設けられるとともに、他方の基板上には異なる色の複数の色素層が配列されたカラーフィルターと透明導電膜からなる複数の第２の電極とが設けられ、前記第１の電極は、前記銀合金膜と前記透明導電膜のうち、銀合金膜が部分的に欠落した領域からなる光透過領域を各画素内に有するとともに、前記光透過領域を含む前記銀合金膜と前記透明導電膜のいずれか一方の膜の上面または下面の全域を他方の膜が覆っていることを特徴とする。ここで言う「画素」とは、平面的に見て第１の電極と第２の電極が重なり合った各領域のことである。

【００１２】本発明の液晶表示装置の基本構成は、一方の基板上に、各画素内に光透過領域を有する銀合金膜と透明導電膜の積層膜からなる第１の電極が設けられ、他方の基板上に、カラーフィルターと透明導電膜からなる第２の電極が設けられた半透過反射型カラー液晶表示装置である。そして、本発明の最大の特徴点は、光透過領域を含む銀合金膜と透明導電膜のいずれか一方の膜の上面または下面の全域を他方の膜で覆ったことである。つまり、第１の電極の形成領域のうち、光透過領域には銀合金膜が存在しないので、透明導電膜も存在しなければ液晶に電界が印加されないことになる。ところが、本発明の構成において、光透過領域を含む銀合金膜と透明導電膜のいずれか一方の膜の上面または下面の全域を他方の膜で覆ったことにより、光透過領域には必ず透明導電膜が存在することになる。したがって、本発明によれば、銀合金膜の使用により反射モードでの表示の明るさが向上するとともに、光透過領域上の液晶にも電界が印加されることになり、透過モードでの表示が可能となる。

【００１３】前記光透過領域の具体的な形態としては、例えば各画素内において銀合金膜のパターンを窓状に開口させたものでもよいし、各画素内において銀合金膜のパターンの幅よりも透明導電膜のパターンの幅の方を大きく形成し、銀合金膜が存在しない透明導電膜の縁部を光透過領域としたものでもよい。さらに、これら２つの形態を兼ね備えたものでもよい。

【００１４】本発明が適用できる液晶表示装置の形態と

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しては、パッシブマトリクス方式の液晶表示装置が挙げられる。その場合、前記複数の第１の電極がストライプ状に形成されたセグメント電極となり、前記複数の第２の電極が第１の電極と交差する方向にストライプ状に形成されたコモン電極となる。その他、薄膜ダイオード（Thin Film Diode,以下、ＴＦＤと略記する）等をスイッチング素子に用いたアクティブマトリクス方式の液晶表示装置にも適用が可能である。

【００１５】本発明の電子機器は、上記本発明の液晶表示装置を備えたことを特徴とする。この構成によれば、反射モード、透過モードの双方での表示が可能な表示部を備えた電子機器を実現することができる。

【００１６】

【発明の実施の形態】［第１の実施の形態］以下、本発明の第１の実施の形態を図１～図３を参照して説明する。図１は本実施の形態の液晶表示装置の全体構成を示す平面図、図２は同、液晶表示装置の表示領域の拡大図、図３は図２のＡ－Ａ’線に沿う断面図である。本実施の形態は、パッシブマトリクス方式の半透過反射型カラー液晶表示装置の例である。なお、以下の全ての図面においては、図面を見やすくするため、各構成要素の膜厚や寸法の比率などは適宜異ならせてある。

【００１７】本実施の形態の液晶表示装置１は、図１に示すように、平面視矩形状の下基板２（一方の基板）と上基板３（他方の基板）とがシール材４を介して対向配置されている。シール材４の一部は各基板２，３の一辺（図１における上辺）側で開口して液晶注入口５となっており、双方の基板２，３とシール材４とに囲まれた空間内に液晶が封入され、液晶注入口６が封止材６によって封止されている。本実施の形態では、上基板３よりも下基板２の外形寸法の方が大きく、上基板３と下基板２の１辺（図１における上辺）では縁が揃っているが、上基板３の残りの３辺（図１における下辺、右辺、左辺）からは下基板２の周縁部がはみ出すように配置されている。そして、下基板２の下辺側の端部に上基板３、下基板２双方の電極を駆動するための駆動用半導体素子７が実装されている。なお、符号８は有効表示領域の周囲を遮光するための遮光層（周辺見切り）である。

【００１８】本実施の形態の場合、図１および図２に示すように、下基板２上に、図中縦方向に延在する複数のセグメント電極１０（第１の電極）がストライプ状に形成されている。一方、上基板３上には、セグメント電極１０と直交するように図中横方向に延在する複数のコモン電極１１（第２の電極）がストライプ状に形成されている。カラーフィルター１３のＲ、Ｇ、Ｂの各色素層１３ｒ，１３ｇ，１３ｂは各セグメント電極１０の方向に対応して配置（縦ストライプ／ＲＧＢのそれぞれがストライプ状に縦に同色で形成配置）されており、図２に示す横方向に並んだＲ、Ｇ、Ｂの３個の画素で画面上の１個のドットが構成されている。断面構造の詳細については後述するが、セグメント電極１０はＡＰＣ膜とＩＴＯ膜の積層構造を有しており、ＡＰＣ膜が半透過反射膜として機能するように、本実施の形態ではＡＰＣパターンが各画素毎に２個ずつの光透過用の窓部１２（光透過領域）を有している。窓部１２は、カラーフィルター１３の各色素層１３ｒ，１３ｇ，１３ｂを複数の画素にわたって縦方向に見たときに千鳥状に配置されている。なお、ここで言う「画素」とは、図２に示すように、セグメント電極１０とコモン電極１１とが平面的に見て重なり合った各領域のことである。

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【００１９】図１に示すように、複数のコモン電極１１のうち、図１の上側半分のコモン電極１１については、引き回し配線１４がコモン電極１１の右端からシール材４に向けて引き出され、シール材４中に混入させた異方性導電粒子等の上下導通材を介して上基板３から下基板２上に電気的な接続がなされ、下基板２上の周縁部に引き回され、駆動用半導体素子７の出力端子に接続されている。同様に、図１の下側半分のコモン電極１１はその左端からシール材４に向けて引き回し配線１４が引き出され、シール材４中に混入させた異方性導電粒子等の上下導通材を介して下基板２上に電気的な接続がなされ、下基板２上の周縁部に引き回され、駆動用半導体素子７の出力端子に接続されている。一方、セグメント電極１０については、引き回し配線１５がセグメント電極１０の下端からシール材４に向けて引き出され、そのまま駆動用半導体素子７の出力端子に接続されている。本実施の形態の場合、これら引き回し配線１４，１５もＡＰＣ膜とＩＴＯ膜との積層膜で構成されている。また、駆動用半導体素子７に各種信号を供給するための入力用配線１６が下基板２の下辺から駆動用半導体素子７の入力端子に向けて設けられている。

【００２０】断面構造を見ると、図３に示すように、ガラス、プラスチック等の透明基板からなる下基板２上に、ＩＴＯ膜１９上にＡＰＣ膜１８が積層された２層構造のセグメント電極１０が紙面を貫通する方向にストライプ状に形成されており、その上に例えば表面にラビング処理が施されたポリイミド等からなる配向膜２０が形成されている。すなわち、ＡＰＣパターン１８には半透過反射膜として機能するように光透過用の窓部１２が形成されているが、この窓部１２の部分を含むＡＰＣパターン１８の下面の全域にはＩＴＯパターン１９が存在している。

【００２１】一方、ガラス、プラスチック等の透明基板からなる上基板３上に、Ｒ、Ｇ、Ｂの各色素層１３ｒ，１３ｇ，１３ｂからなるカラーフィルター１３が形成され、カラーフィルター１３上には各色素層間の段差を平坦化すると同時に各色素層の表面を保護するためのオーバーコート膜２１が形成されている。このオーバーコート膜２１はアクリル、ポリイミド等の樹脂膜でもよいし、シリコン酸化膜等の無機膜でもよい。さらに、オー

バーコート膜２１上にＩＴＯの単層膜からなるコモン電極１１が紙面に平行な方向にストライプ状に形成されており、その上に例えば表面にラビング処理が施されたポリイミド等からなる配向膜２２が形成されている。上基板３と下基板２との間にはＳＴＮ（Super Twisted Nematic）液晶等からなる液晶２３が挟持されている。バックライト（図示略）が下基板２の下面側に配置されている。また、例えば樹脂ブラックや比較的反射率の低いクロム等の金属などからなるブラックストライプ２５が、Ｒ、Ｇ、Ｂの各色素層１３ｒ，１３ｇ，１３ｂの間（境界）を区画するように設けられている。本実施の形態の場合、ブラックストライプ２５の幅Ｗが隣接するセグメント電極１０間の間隔Ｐ１に一致している。

【００２２】本実施の形態の液晶表示装置においては、セグメント電極１０がＩＴＯパターン１９上にＡＰＣパターン１８を積層した構造となっており、ＡＰＣパターン１８が開口した光透過用の窓部１２の部分にもＩＴＯパターン１９が必ず存在している。そのため、ＩＴＯパターン１９によって窓部１２の直上の液晶にも電界が印加されることになり、透過モードでの表示が可能となる。これにより、半透過反射膜としてＡＰＣ膜を用いたことで反射モードでの明るい表示が可能であると同時に、透過モードでの表示を確実に可能とする液晶表示装置を実現することができる。

【００２３】また、本実施の形態の場合、隣接するセグメント電極１０間の間隙を完全に覆うように対向して配置された上基板３上にブラックストライプ２５を設けたことによってこの領域における透過モードでのバックライトからの光の漏れがなくなり、カラーフィルターの混色を防止することができる。また本実施の形態は、上基板３上のカラーフィルター１３中にブラックストライプ２５を形成する構成のため、製造プロセス、特に下基板２側の製造プロセスを複雑化することなく、容易に混色対策を実施することができる。

【００２４】装置の全体構成としては、ＡＰＣを含む引き回し配線の抵抗が低くなることで配線幅の微細化が図れ、その結果、狭額縁化を実現することができる。さらに本実施の形態の場合、上下導通材を用いてセグメント電極１０の駆動とコモン電極１１の駆動を下基板２上の１個の駆動用半導体素子７で担うようにしたことで額縁領域を全体として狭くでき、これによっても狭額縁化が図れるので、小型の携帯用電子機器などに好適な液晶表示装置を提供することができる。

【００２５】［第２の実施の形態］以下、本発明の第２の実施の形態を図４、図５を参照して説明する。本実施の形態において、液晶表示装置の全体構成は図１に示した第１の実施の形態と同様であるため、詳細な説明は省略する。第１の実施の形態と異なる点はセグメント電極の構成のみであり、この部分のみについて図４、図５を用いて説明する。図４は本実施形態の液晶表示装置の表示領域の拡大図、図５は図４のＢ－Ｂ’線に沿う断面図である。

【００２６】表示領域について見ると、図４に示すように、下基板２上に、図中縦方向に延在する複数のセグメント電極３０がストライプ状に形成されている。一方、上基板３上には、セグメント電極３０と直交するように図中横方向に延在する複数のコモン電極１１がストライプ状に形成されている。カラーフィルター１３のＲ、Ｇ、Ｂの各色素層１３ｒ，１３ｇ，１３ｂは各セグメント電極３０の方向に対応して配置されており、図２に示す横方向に並んだＲ、Ｇ、Ｂの３個の画素で画面上の１個のドットが構成されている。以上の基本構成は第１の実施の形態と同様である。

【００２７】本実施の形態の場合は、図５に示すように、第１の実施の形態とは逆に、セグメント電極３０はＷ２の幅で形成されたＡＰＣ膜３１とこれを覆うＷ１の幅で形成されたＩＴＯ膜３２の積層構造を有しており、しかも、ＡＰＣ膜３１の側面もＩＴＯ膜３２で覆われている。第１の実施の形態のように、ＡＰＣパターンに光透過用の窓部は形成されていない。一方、上基板３側は、第１の実施の形態と同様、樹脂ブラックやクロム等の金属などからなるブラックストライプ３３が、Ｒ、Ｇ、Ｂの各色素層１３ｒ，１３ｇ，１３ｂの間を区画するように設けられている。本実施の形態では、ブラックストライプ３３の幅Ｗが隣接する画素のＩＴＯパターン３２のピッチＰ１（セグメント電極３０のピッチ）に一致しており、ＡＰＣパターン３１のピッチＰ２より小さく設定されている。そして、本構成の液晶表示装置の組立工程において上基板３、下基板２の貼り合わせ時に生じるズレ量（例えば起こり得る最大のズレ量）をＥとすると、ブラックストライプ３３の縁からＡＰＣパターン３１の縁までの寸法Ｄ（本実施の形態では、１つのセグメント電極３０のＩＴＯパターン３２の縁からＡＰＣパターン３１の縁までの寸法と一致する）が上記のズレ量Ｅ以上となる（Ｄ≧Ｅ）ように設定されている。

【００２８】これを図４で見ると、セグメント電極３０の輪郭を示す外側の線がＩＴＯパターン３２の縁、その内側の線がＡＰＣパターン３１の縁を示しているが、ブラックストライプ３３の輪郭を示す線はＩＴＯパターン３２の縁を示す線に重なっている。つまり、平面的に見ると、セグメント電極３０の左右の縁の細長い部分はＡＰＣパターン３１が存在せず、ＩＴＯパターン３２のみが存在する領域であって、かつブラックストライプ３３に覆われない領域である。したがって、この領域は透過モード時にバックライトからの光が透過する光透過領域となる。以下の説明では、この領域のことを、便宜上サイドスリット３４と呼ぶことにする。すなわち、本実施の形態におけるサイドスリット３４は、第１の実施の形態における光透過用窓部をなくした分、ＡＰＣパターン３１の幅Ｗ２を狭くすることによってセグメント電極３

０の縁にＩＴＯパターン３２のみが存在する光透過領域を設けたものということができる。つまり、平面視した際に上基板３に形成されたブラックストライプ３３と下基板２に形成されたＡＰＣパターン３１との間隔（隙間）にＩＴＯパターン３２が配置されているため、背面からの光の透過が可能な上、コモン電極１１との間で液晶２３に電界を加えることができるので、透過表示を行うことができる。

【００２９】本実施の形態の液晶表示装置においては、セグメント電極３０がＡＰＣパターン３１上にＩＴＯパターン３２を積層した構造となっており、ＡＰＣパターン３１の幅を狭くするとともにその部分をブラックストライプ３３で覆わない構成とし、透過モード時にバックライトからの光が透過するセグメント電極３０の縁のサイドスリット３４の部分にはＩＴＯパターン３２が存在している。そのため、ＩＴＯパターン３２によってサイドスリット３４の直上の液晶にも電界が印加されることになり、透過モードでの表示が可能となる。これにより、半透過反射膜としてＡＰＣ膜を用いたことにより反射モードでの明るい表示が可能であると同時に、透過モードでの表示を確実に可能とする液晶表示装置を実現することができる。

【００３０】さらに、サイドスリット３４は単に光透過領域として機能するだけでなく、貼り合わせズレによる反射モードでの輝度の低下を防止する構造としても機能する。すなわち、第１の実施の形態のように、ブラックストライプ２５の幅Ｗがセグメント電極１０の間隔、すなわちＡＰＣパターン１８の間隔Ｐ２に一致し、平面的に見てブラックストライプ２５の縁がＡＰＣパターン１８の縁に重なっている場合、貼り合わせズレがなければ問題ないが、少しでも貼り合わせズレがあるとブラックストライプ２５がＡＰＣパターン１８上にかかってしまうため、ＡＰＣパターン１８の反射膜としての有効面積が減り、反射モードでの表示が暗くなるという欠点を持っている。

【００３１】これに対して、本実施の形態ではサイドスリット３４を設け、しかもサイドスリット３４の幅（上で述べたブラックストライプ３３の縁からＡＰＣパターン３１の縁までの寸法Ｄに相当する）を貼り合わせズレ量よりも大きくとっているので、貼り合わせズレが生じたとしてもブラックストライプ３３がＡＰＣパターン３１上にかかることはない。なお、貼り合わせズレが生じると１つの画素において片側のサイドスリット３４の幅が細くなるが、その分反対側のサイドスリット３４の幅が太くなるため、画素全体として光の透過量が変わることもない。このように、貼り合わせズレがあっても反射モードでの表示が暗くなることがなく、ブラックストライプでカラーフィルターの混色を防止しつつ、貼り合わせズレに強い構造を提供することができる。

【００３２】また、製造工程中にＡＰＣ膜に汚染等が付着すると、セグメント電極や引き回し配線の腐食、エレクトロマイグレーション等が発生する原因となる。その点、本実施の形態では、ＡＰＣパターン３１の側面をＩＴＯパターン３２で覆っているので、配線の腐食やエレクトロマイグレーションを充分に防止することができる。

【００３３】［電子機器］上記実施の形態の液晶表示装置を備えた電子機器の例について説明する。図６は、携帯電話の一例を示した斜視図である。図６において、符号１０００は携帯電話本体を示し、符号１００１は上記の液晶表示装置を用いた液晶表示部を示している。

【００３４】図７は、腕時計型電子機器の一例を示した斜視図である。図７において、符号１１００は時計本体を示し、符号１１０１は上記の液晶表示装置を用いた液晶表示部を示している。

【００３５】図８は、ワープロ、パソコンなどの携帯型情報処理装置の一例を示した斜視図である。図８において、符号１２００は情報処理装置、符号１２０２はキーボードなどの入力部、符号１２０４は情報処理装置本体、符号１２０６は上記の液晶表示装置を用いた液晶表示部を示している。

【００３６】図６～図８に示す電子機器は、上記実施の形態の液晶表示装置を用いた液晶表示部を備えているので、反射モードでの明るさと透過モードでの鮮やかな表示色を兼ね備えた表示部を有する電子機器を実現することができる。

【００３７】なお、本発明の技術範囲は上記実施の形態に限定されるものではなく、本発明の趣旨を逸脱しない範囲において種々の変更を加えることが可能である。例えば第１の実施の形態では光透過用の窓部のみを設けた例、第２の実施の形態ではサイドスリットのみを設けた例を示したが、窓部とサイドスリットの双方を兼ね備える構成としてもよい。これら窓部やサイドスリットの形状、寸法、数、形成位置等に関しては、例えば反射モードと透過モードの輝度のバランス、表示の見栄えなどに応じて適宜設定すればよい。また、セグメント電極の構成としてＡＰＣ膜とＩＴＯ膜の２層構造の例を示したが、その他、ＡＰＣ膜の上下をＩＴＯ膜で挟んだ３層構造としてもよい。

【００３８】また、上記２つの実施の形態では上基板上のカラーフィルターの色素層間にブラックストライプを設けた例を示したが、ブラックストライプを設ける層の位置は他の層の間であってもよい。もしくは、下基板側にブラックストライプを設けてもよい。また、隣接するセグメント電極の間隙に沿った領域にブラックストライプを設けることに代えて、隣接するコモン電極の間隙に沿った領域にブラックストライプを設けてもよい。さらに、反射膜材料としてはＡＰＣ膜の他、銀・パラジウム合金（ＡＰ）膜などの銀合金膜を用いてもよい。上記実施の形態では、本発明をパッシブマトリクス方式の液晶

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表示装置に適用したが、ＴＦＤ等をスイッチング素子に用いたアクティブマトリクス方式の液晶表示装置にも適用可能である。

【００３９】

【発明の効果】以上、詳細に説明したように、本発明によれば、光透過領域を含む銀合金膜と透明導電膜のいずれか一方の膜の上面または下面の全域を他方の膜で覆ったことにより、光透過領域に必ず透明導電膜が存在することになる。したがって、銀合金膜の使用により反射モードでの表示の明るさが向上するとともに、透明導電膜により光透過領域上の液晶にも電界が印加されることになり、透過モードでの表示が可能な液晶表示装置を実現することができる。さらに、比抵抗の低い銀合金膜を電極および配線に用いたことで配線幅の微細化が可能なため、狭額縁化が図れ、小型の携帯用電子機器に好適な液晶表示装置を提供することができる。

【図面の簡単な説明】

【図１】　本発明の第１、第２の実施の形態に共通の液晶表示装置の全体構成を示す平面図である。

【図２】　第１の実施形態の液晶表示装置の表示領域の拡大平面図である。

【図３】　図２のＡ－Ａ’線に沿う断面図である。

【図４】　第２の実施形態の液晶表示装置の表示領域の拡大平面図である。

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【図５】　図４のＢ－Ｂ’線に沿う断面図である。

【図６】　本発明の電子機器の一例を示す斜視図である。

【図７】　同、電子機器の他の例を示す斜視図である。

【図８】　同、電子機器のさらに他の例を示す斜視図である。

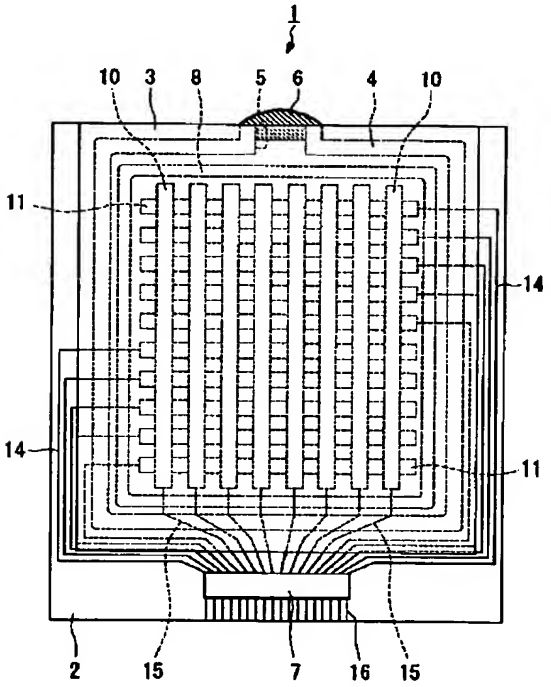
【図９】　ＡＰＣとＩＴＯの積層膜を半透過反射膜とした液晶表示装置の一例を示す断面図である。

【図１０】　Ａｌ膜を半透過反射膜とした液晶表示装置の一例を示す断面図である。

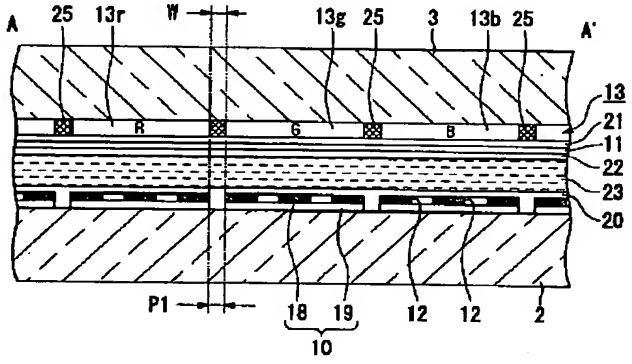
【符号の説明】

１　液晶表示装置
２　下基板（一方の基板）
３　上基板（他方の基板）
１０，３０　セグメント電極（第１の電極）
１１　コモン電極（第２の電極）
１２　窓部（光透過領域）
１３　カラーフィルター
１３ｒ，１３ｇ，１３ｂ　色素層
１８，３１　ＡＰＣ膜（ＡＰＣパターン、銀合金膜）
１９，３２　ＩＴＯ膜（ＩＴＯパターン、透明導電膜）
２３　液晶
２５，３３　ブラックストライプ（遮光層）
３４　サイドスリット（光透過領域）

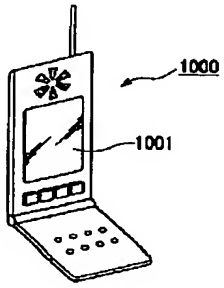
【図１】



【図３】



【図６】



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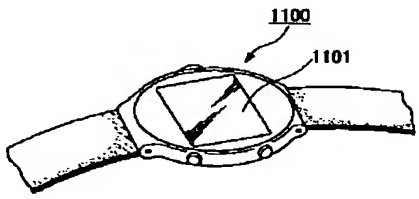
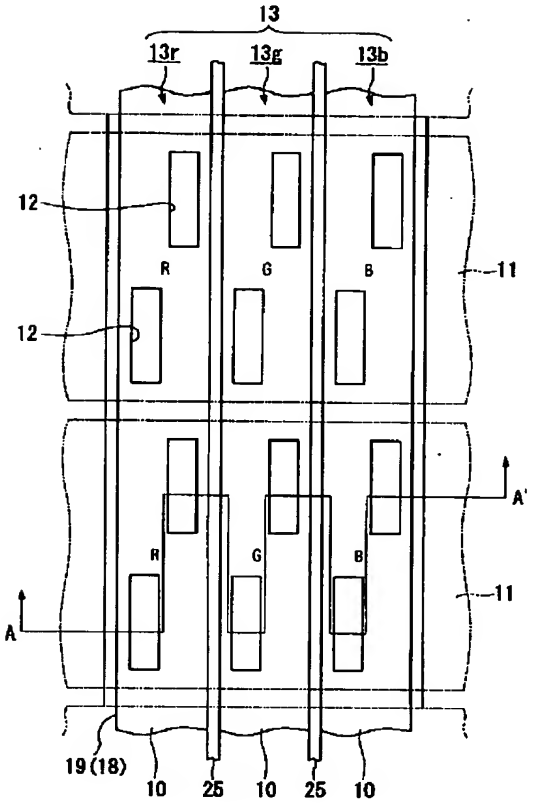
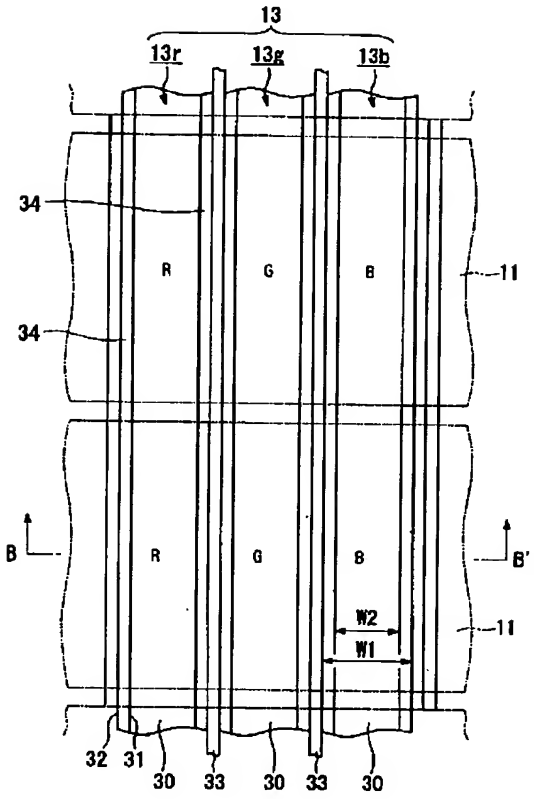


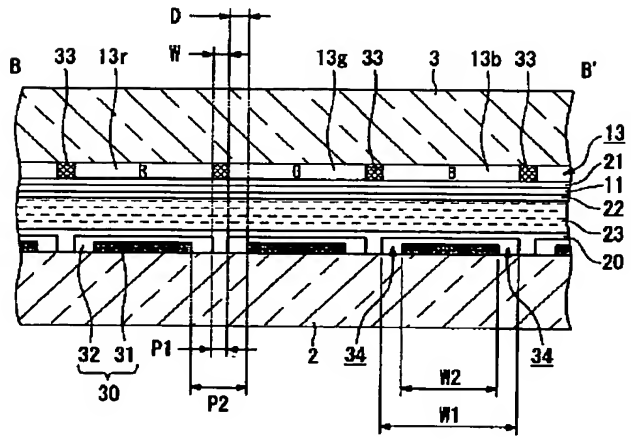
【図２】


13
13r
13g
13b
12
12
R
G
B
11
A
A'
19(18)
10
25
10
25
10

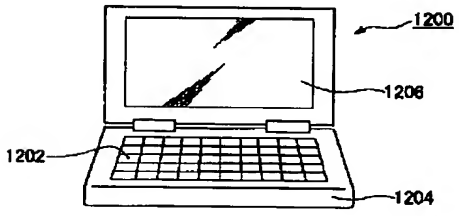
【図４】


13
13r
13g
13b
34
34
R
G
B
11
B
B'
W2
W1
32
31
30
33
30
33
30

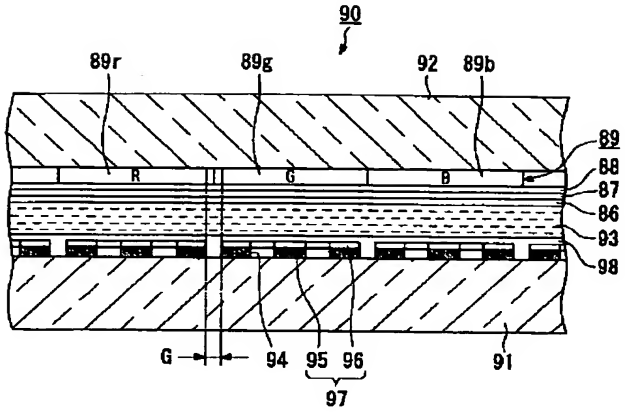
【図５】


D
W
B
33
13r
13g
33
3
13b
33
B'
13
21
11
22
23
20
32
31
30
P1
P2
2
34
34
W2
W1

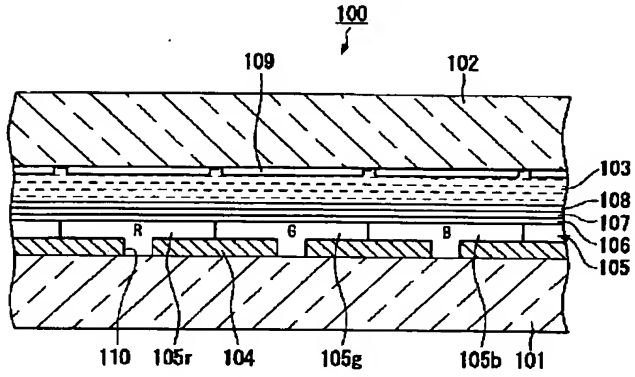
【図８】


1200
1206
1202
1204

【図９】



【図１０】



フロントページの続き

(51) Int. Cl.[7]	識別記号	F I	テーマコード（参考）
Ｇ０９Ｆ　9/30	３４１	Ｇ０９Ｆ　9/30	３４１
	３４３		３４３Ｚ
	３４９		３４９Ａ

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The substrate for electro-optics equipments carry out that have the reflecting layer which has substantially the transparency section which can penetrate light, and the reflective section which reflects light in the substrate for electro-optics equipments, and the coloring layer prepared in the aforementioned reflecting layer, the aforementioned coloring layer is arranged at the aforementioned transparency section so that the aforementioned transparency section may cover, and two or more aforementioned coloring layers are arranged in a dot configuration at the aforementioned reflective section as the feature.
[Claim 2] The substrate for electro-optics equipments which is equipped with the reflecting layer which has the reflective section which reflects light in the substrate for electro-optics equipments, and the coloring layer prepared in the aforementioned reflecting layer, and is characterized by arranging two or more aforementioned coloring layers at a dot configuration at the aforementioned reflective section.
[Claim 3] The area of the aforementioned coloring layer arranged in the substrate for electro-optics equipments according to claim 1 at the aforementioned reflective section is a substrate for electro-optics equipments characterized by being 10% - 90% of the area of the aforementioned reflective section.
[Claim 4] The portion arranged in the substrate for electro-optics equipments according to claim 1 at the aforementioned reflective section of the portion arranged at the aforementioned transparency section of the aforementioned coloring layer and the aforementioned coloring layer is a substrate for electro-optics equipments characterized by including the material of the same optical concentration.
[Claim 5] For the 1st material of the above, and the 2nd material of the above, the portion by which the portion arranged at the aforementioned transparency section of the aforementioned coloring layer is arranged in the substrate for electro-optics equipments according to claim 1 at the aforementioned reflective section of the aforementioned coloring layer including the 1st material is a substrate for electro-optics equipments characterized by optical concentration differing mutually including the 2nd material.
[Claim 6] It is the substrate for electro-optics equipments characterized by being arranged so that each may estrange two or more aforementioned dot configurations in the substrate for electro-optics equipments according to claim 1.
[Claim 7] It is the substrate for electro-optics equipments characterized by at least two of two or more aforementioned dot configurations having touched in the substrate for electro-optics equipments according to claim 1.
[Claim 8] It is the substrate for electro-optics equipments characterized by being arranged so that each aforementioned dot configuration may be arranged along a predetermined direction in the substrate for electro-optics equipments according to claim 1.
[Claim 9] It is the substrate for electro-optics equipments characterized by arranging each aforementioned dot configuration at random in the substrate for electro-optics equipments according to claim 1.
[Claim 10] It is the substrate for electro-optics equipments characterized by each aforementioned dot

configuration containing a polygon or an ellipse form in the substrate for electro-optics equipments according to claim 1.
[Claim 11] The manufacture method of the substrate for electro-optics equipments characterized by to apply coloring layer material to the aforementioned reflective section from the nozzle which can be scanned in the predetermined direction, and to form two or more coloring layers in the aforementioned reflective section at a dot configuration in the manufacture method of the substrate for electro-optics equipments equipped with the reflecting layer which has substantially the transparency section which can penetrate light, and the reflective section which reflects light.
[Claim 12] In the electro-optics equipment which has the substrate of a couple to one aforementioned substrate The reflecting layer which has the reflective section which reflects substantially the transparency section and light which can penetrate light is prepared. to the aforementioned substrate of another side It is electro-optics equipment characterized by being arranged so that the part may be covered at least in the field corresponding to the aforementioned transparency section while a coloring layer is prepared so that it may lap with the aforementioned reflecting layer superficially, and the aforementioned coloring layer is arranged in the field corresponding to the aforementioned reflective section at a dot configuration.
[Claim 13] In the electro-optics equipment which has the substrate of a couple between the aforementioned substrates It is arranged so that the 1st electrode for a display, a coloring layer, the 2nd electrode for a display, and a reflecting layer may lap superficially, and a pixel field is defined as the field with which the 1st electrode of the above and the 2nd electrode of the above lap. the aforementioned reflecting layer It has the reflective section which reflects substantially the transparency section and light which can penetrate light in the aforementioned pixel field. the aforementioned coloring layer Electro-optics equipment characterized by being arranged so that the part may be covered at least in the field corresponding to the aforementioned transparency section while more than one are arranged in the field corresponding to the aforementioned reflective section at a dot configuration.
[Claim 14] The area of the aforementioned coloring layer arranged to the field corresponding to the aforementioned reflective section in electro-optics equipment according to claim 12 or 13 is electro-optics equipment characterized by being 10% - 90% of the area of the aforementioned reflective section.

[Claim 15] The portion arranged in electro-optics equipment according to claim 12 or 13 to the field corresponding to the aforementioned reflective section of the portion arranged to the field corresponding to the aforementioned transparency section of the aforementioned coloring layer and the aforementioned coloring layer is electro-optics equipment characterized by including the material of the same optical concentration.
[Claim 16] For the 1st material of the above, and the 2nd material of the above, the portion by which the portion arranged to the field corresponding to the aforementioned transparency section of the aforementioned coloring layer is arranged to the field corresponding to the aforementioned reflective section of the aforementioned coloring layer in electro-optics equipment according to claim 12 or 13 including the 1st material is electro-optics equipment characterized by for optical concentration to differ mutually including the 2nd material.
[Claim 17] In the substrate for electro-optics equipments, it has the reflecting layer which has two or more transparency section and two or more reflective sections, and two or more coloring layers which are prepared in the aforementioned reflecting layer and from which a color differs respectively. in each aforementioned transparency section It is the substrate for electro-optics equipments which two or more aforementioned coloring layers which the aforementioned corresponding coloring layer is arranged and correspond to each aforementioned reflective section are arranged at a dot configuration, and is carried out [that the area by which at least one of two or more of the aforementioned coloring layers is arranged at others and the aforementioned reflective section differs, and] as the feature so that each aforementioned transparency section may be covered.
[Claim 18] Electronic equipment which is equipped with the electro-optics equipment indicated by any 1 term of claims 12-16, and the control means which control the aforementioned electro-optics equipment,

and is characterized by the bird clapper.

[Translation done.]

* NOTICES *

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the outline perspective diagram showing the appearance structure of the liquid crystal equipment which is the gestalt of operation of the 1st of this invention.
[Drawing 2] It is explanatory drawing showing the liquid crystal equipment which is the gestalt of operation of the 1st of this invention, and is an outline cross section [in / the X-X' line of (a) / (a) and / in (b)]. / an expansion part plan
[Drawing 3] It is explanatory drawing showing the liquid crystal equipment which is the gestalt of operation of the 2nd of this invention, and is an outline cross section [in / the Y-Y' line of (a) / (a) and / in (b)]. / an expansion part plan
[Drawing 4] It is explanatory drawing showing the liquid crystal equipment which is the gestalt of operation of the 3rd of this invention, and is an outline cross section [in / the Z-Z' line of (a) / (a) and / in (b)]. / an expansion part plan
[Drawing 5] It is outline explanatory-drawing (a) - (d) which shows typically the lap state of the reflecting layer and coloring layer of the examples 1-4 of composition of the electro-optics equipment of this invention.
[Drawing 6] It is the outline cross section showing the manufacturing process for forming the substrate for electro-optics equipments of this invention in order of a process.
[Drawing 7] It is outline explanatory-drawing (a) - (c) which shows typically the lap state of the reflecting layer and coloring layer of the modifications 1-3 of the electro-optics equipment of this invention.
[Drawing 8] It is outline explanatory-drawing (a) - (c) which shows typically the lap state of the reflecting layer and coloring layer of the modifications 4-6 of the electro-optics equipment of this invention.
[Drawing 9] It is the outline block diagram showing the whole gestalt composition of operation of the electronic equipment of this invention.
[Drawing 10] It is the perspective diagram showing the portable telephone which is an example in the gestalt of operation of the electronic equipment of this invention.
[Drawing 11] It is the outline cross section showing typically the structure of conventional transflective reflection type liquid crystal equipment.
[Description of Notations]
100 -- Liquid crystal equipment
101,102 -- Substrate
103 -- Sealant
104 -- Liquid crystal
105,107 -- Phase contrast board (1/4 wavelength plate)
106,108 -- Polarizing plate
109 -- Back light
111 -- Reflecting layer

111a -- Transparency section (opening)
111r -- Reflective section
112 -- Light filter
112r, 112g, 112b -- Coloring layer
112p -- Surface-protection layer
113 121 -- Transparent electrode
200 -- Liquid crystal equipment
200A -- Panel structure
200B -- Drive circuit
210 -- Substrate for liquid crystal equipments
210T -- Substrate overhang section
211 -- The 1st substrate
212 -- Reflecting layer
212a -- Translucent part (opening)
212r -- Reflective section
215 -- Surface-protection layer
216 -- Transparent electrode
217 -- Orientation film
218,218A, 218B -- Wiring
219 -- Input terminal section
220 -- Opposite substrate
221 -- The 2nd substrate
222 -- Transparent electrode
223 -- Liquid crystal
224,225 -- Coloring layer
228 -- Wiring
230 -- Sealant
230a -- Inlet
233 -- Hard protective coat
234 -- Orientation film
231 -- Sealing agent
240,250 -- Phase contrast board
241,251 -- Polarizing plate
261 -- Semiconductor IC
263 -- Flexible wiring substrate
300 -- Liquid crystal equipment
311 -- The 1st substrate
312 -- Reflecting layer
312a -- Translucent part (opening)
312r -- Reflective section
315 -- Surface-protection layer
316 -- Transparent electrode
317 -- Orientation film
320 -- Opposite substrate
321 -- The 2nd substrate
322 -- Transparent electrode
323 -- Liquid crystal
324,325 -- Coloring layer
324BM -- Black shading film
328 -- Wiring
330 -- Sealant

333 -- Hard protective coat
334 -- Orientation film
340,350 -- Phase contrast board
341,351 -- Polarizing plate
400 -- Liquid crystal equipment
411 -- The 1st substrate
412 -- Reflecting layer
412a -- Translucent part (opening)
412r -- Reflective section
415 -- Surface-protection layer
416 -- Transparent electrode
417 -- Orientation film
420 -- Opposite substrate
421 -- The 2nd substrate
422 -- Transparent electrode
423 -- Liquid crystal
424,425 -- Coloring layer
424BM -- Black shading film
426 -- Surface-protection layer
428 -- Wiring
430 -- Sealant
433 -- Hard protective coat
434 -- Orientation film 440,450 -- Phase contrast board
441,451 -- Polarizing plate
1600 -- Control means
1610 -- Source of a display information output
1620 -- Display-processing circuit
1630 -- Power circuit
1640 -- Timing generator
2000 -- Portable telephone
2010 -- Case object
2001 -- Circuit board
2020 -- Operation button
2040 -- Receiver section
2050 -- Transmission section
2060 -- Display window
A -- Image display field

[Translation done.]

* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the substrate for electro-optics equipments and its manufacture method, electro-optics equipment, and electronic equipment. When used for the electro-optics equipment in electronic equipment, such as a portable telephone and a carried type personal computer, while raising the luminosity of the image display in a reflected type in more detail, the color tone (thickness of a color) of the image display in a penetrated type is raised relatively, and it is related with the substrate for electro-optics equipments which can reduce the difference in the color in the image display of both a reflected type and a penetrated type and its manufacture method, electro-optics equipment, and electronic equipment.
[0002]
[Description of the Prior Art] In recent years, electro-optics equipment, for example, liquid crystal equipment, is widely used for electronic equipment, such as a portable telephone and a carried type personal computer. When this liquid crystal equipment has various gestalten by the use, for example, it is used in a dark place, or when you need especially the brightness of the image display section The penetrated type liquid crystal equipment which displays by carrying out incidence of the light from the source of a back light of liquid crystal equipment is used, and when a service space is fully bright, or when you do not need especially the brightness of the image display section Incidence of the outdoor daylight, such as the natural light and indoor lighting, is carried out from the front face of the image display section, and the reflected type which displays by reflecting this light is used. Furthermore, the so-called transflective reflection type liquid crystal equipment in which the image display of both these reflection type and a penetrated type is possible is also used.
[0003] Drawing 11 is the outline cross section showing typically the structure of conventional transflective reflection type liquid crystal equipment 100. This liquid crystal equipment 100 is equipped with the structure with which the substrate 101 and the substrate 102 were stuck by the sealant 103, and enclosed liquid crystal 104 between the substrate 101 and the substrate 102.
[0004] On the inside of a substrate 101, the reflecting layer 111 which has translucent part (opening) 111a and reflective section 111b for every pixel is formed, and the light filter 112 equipped with the coloring layers 112r, 112g, and 112b and surface-protection layer 112p on this reflecting layer 111 is formed. The transparent electrode 113 is formed on the front face of surface-protection layer 112p of a light filter 112.
[0005] On the other hand, a transparent electrode 121 is formed on the inside of a substrate 102, and it is constituted so that the above-mentioned transparent electrode 113 on the substrate 101 which counters may be intersected. In addition, on a substrate 101 and a substrate 102, an orientation film, a hard transparent membrane, etc. are formed suitably if needed.
[0006] Moreover, on the superficies of the above-mentioned substrate 102, the phase contrast board (1/4 wavelength plate) 105 and a polarizing plate 106 are arranged one by one, and the phase contrast board (1/4 wavelength plate) 107 and a polarizing plate 108 are arranged one by one on the superficies of a

substrate 101.
[0007] The liquid crystal equipment 100 constituted as mentioned above is attached back [the] in the state where the back light 109 has been arranged, when installed in electronic equipment, such as a portable telephone and a carried type personal computer. In this liquid crystal equipment 100, since it is reflected in reflective section 111b, liquid crystal 104 is passed again and it is emitted after outdoor daylight ****** liquid crystal 104 in accordance with the reflective path R, a reflected type display is checked by looking in bright places, such as daytime and indoor. On the other hand, in dark places, such as night and the outdoors, since the light which passed translucent part (opening) 111a among the lighting light of a back light 109 by making a back light 109 turn on passes liquid crystal equipment 100 and is emitted in accordance with the transparency path T, a penetrated type display is checked by looking.
[0008]
[Problem(s) to be Solved by the Invention] However, since two different means of displaying were adopted, there were the following problems in such transflective reflection type liquid crystal equipment.
[0009] In order that the outdoor daylight which carried out incidence from the front face of the image display section may reflect in the reflective section of a reflecting layer and may pass a coloring layer again after it passes a coloring layer when transflective reflection type liquid-crystal equipment is used as a reflected type, the passage distance of a coloring layer becomes compared with a transparency [which passes a coloring layer only at once] type case more than two times, and the luminosity of the picture displayed will fall. Although it is necessary to make coloring layer thickness thin or to decrease pigment concentration in order to obtain the image display of sufficient luminosity, when it uses as such a reflected type, when using as a penetrated type that they are such conditions, the image display of sufficient color tone (thickness of a color) will be obtained. On the contrary, when the conditions of a coloring layer are set up so that the image display of the thickness of color sufficient as a penetrated type may be obtained by thickening a coloring layer or making pigment concentration increase, image display of luminosity sufficient as a reflected type can be obtained. Thus, obtaining the image display of luminosity sufficient as a reflected type and obtaining the image display of the thickness of color sufficient with a penetrated type had the relation of an antinomy, and, as for reconciling both, they had the problem of being very difficult. Moreover, from the difference in the image display method of both a reflected type and a penetrated type, the difference arose in the color of a reflected type and a penetrated type, and there was also a problem of giving a user sense of incongruity.
[0010] When this invention is made in view of an above-mentioned problem and it is used for the electro-optics equipment in electronic equipment, such as a portable telephone and a carried type personal computer, while raising the luminosity of the image display in a reflected type The color tone (thickness of a color) of the image display in a penetrated type is raised relatively, and it aims at offering the substrate for electro-optics equipments which can reduce the difference in the color in the image display of both a reflected type and a penetrated type and its manufacture method, electro-optics equipment, and electronic equipment.
[0011]
[Means for Solving the Problem] In order to solve the above-mentioned problem, it carries out that the substrate of this invention for electro-optics equipments is equipped with the reflecting layer which has substantially the transparency section which can penetrate light, and the reflective section which reflects light, and the coloring layer which are prepared in the aforementioned reflecting layer, the aforementioned coloring layer is arranged at the aforementioned transparency section so that the aforementioned transparency section may cover, and two or more aforementioned coloring layers are arranged in a dot configuration at the aforementioned reflective section as the feature.
[0012] Moreover, the substrate for electro-optics equipments of this invention is equipped with the reflecting layer which has the reflective section which reflects light, and the coloring layer prepared in the aforementioned reflecting layer, and is characterized by arranging two or more aforementioned coloring layers at a dot configuration at the aforementioned reflective section.

[0013] Thus, without reducing the thickness of the color of the image display in a penetrated type, when used for electro-optics equipment, for example, liquid crystal equipment, by constituting, the color tone (thickness of a color) of the image display in a reflected type can be raised relatively, and the difference in the color in the image display of both a reflected type and a penetrated type can be reduced.
[0014] Moreover, the manufacture method of the substrate for electro-optics equipments of this invention applies coloring layer material to the aforementioned reflective section from the nozzle which can scan in the predetermined direction, and is characterized by to form two or more coloring layers in the aforementioned reflective section at a dot configuration in the manufacture method of the substrate equipped with the reflecting layer which has substantially the transparency section which can penetrate light, and the reflective section which reflects light for electro-optics equipments.
[0015] Thus, without reducing the thickness of the color of the image display in a penetrated type by constituting, the color tone (thickness of a color) of the image display in a reflected type can be raised relatively, and the substrate for electro-optics equipments which can reduce the difference in the color in the image display of both a reflected type and a penetrated type can be efficiently manufactured by the low cost.
[0016] In the electro-optics equipment with which the electro-optics equipment of this invention has the substrate of a couple moreover, to one aforementioned substrate The reflecting layer which has the reflective section which reflects substantially the transparency section and light which can penetrate light is prepared. to the aforementioned substrate of another side While a coloring layer is prepared so that it may lap with the aforementioned reflecting layer superficially, and the aforementioned coloring layer is arranged in the field corresponding to the aforementioned reflective section at a dot configuration, in the field corresponding to the aforementioned transparency section, it is characterized by being arranged so that the part may be covered at least.
[0017] Thus, without reducing the thickness of the color of the image display in a penetrated type by constituting, the color tone (thickness of a color) of the image display in a reflected type can be raised relatively, and the difference in the color in the image display of both a reflected type and a penetrated type can be reduced.
[0018] In the electro-optics equipment with which the electro-optics equipment of this invention has the substrate of a couple moreover, between the aforementioned substrates It is arranged so that the 1st electrode for a display, a coloring layer, the 2nd electrode for a display, and a reflecting layer may lap superficially, and a pixel field is defined as the field with which the 1st electrode of the above and the 2nd electrode of the above lap. the aforementioned reflecting layer It has the reflective section which reflects substantially the transparency section and light which can penetrate light in the aforementioned pixel field. the aforementioned coloring layer While more than one are arranged in the field corresponding to the aforementioned reflective section at a dot configuration, in the field corresponding to the aforementioned transparency section, it is characterized by being arranged so that the part may be covered at least.
[0019] Thus, without reducing the thickness of the color of the image display in a penetrated type by constituting, the color tone (thickness of a color) of the image display in a reflected type can be raised relatively, and the difference in the color in the image display of both a reflected type and a penetrated type can be reduced. Moreover, by two or more coloring layers on the reflective section being arranged at a dot configuration, a coloring layer cannot incline in part and the contrast of a reflective display can be raised.
[0020] The substrate for electro-optics equipments of this invention is equipped with the reflecting layer which has two or more transparency section and two or more reflective sections, and two or more coloring layers which are prepared in the aforementioned reflecting layer and from which a color differs respectively. moreover, in each aforementioned transparency section The aforementioned corresponding coloring layer is arranged, two or more aforementioned coloring layers corresponding to each aforementioned reflective section are arranged at a dot configuration, and at least one of two or more of the aforementioned coloring layers carries out that the area arranged at others and the aforementioned reflective section differs as the feature so that each aforementioned transparency section may be

covered.
[0021] Thus, by constituting, the image display excellent in the white balance is realizable. for example, the portion corresponding to [when image display colors yellow by the reflection property of a reflecting layer in the coloring layer which consists of either of three colors of R (red), G (green), and B (blue)] B (blue) among the area of a coloring layer -- extending -- a blue component -- an amendment -- by things, a white display is attained and image display excellent in the white balance can be realized
[0022]
[Embodiments of the Invention] Hereafter, it explains concretely, referring to a drawing taking the case of the substrate for liquid crystal equipments, and liquid crystal equipment about the gestalt of operation of the substrate for electro-optics equipments of this invention, and electro-optics equipment. In addition, in order to make each class and each part material into the size of the grade which can be recognized on a drawing, scales are made to have differed for each class or every each part material in each drawing used for explanation of the gestalt of this operation.
[0023] [Gestalt of the 1st operation] drawing 1 is the outline perspective diagram showing the appearance structure of the liquid crystal equipment 200 which is the gestalt of operation of the 1st of the electro-optics equipment of this invention. This liquid crystal equipment 200 is electro-optics equipment of a so-called transflective reflection type passive matrix method, and comes suitably to attach lighting systems, case objects, etc. which are not illustrated if needed, such as a back light and a front light.
[0024] The substrate 210 for liquid crystal equipments which makes a base the 1st transparent substrate 211 which liquid crystal equipment 200 becomes from a glass plate, a synthetic-resin board, etc. as shown in drawing 1 , After the opposite substrate 220 which makes a base the 2nd same substrate 221 which counters this is stuck through a sealant 230 and the liquid crystal as an electrooptic material is poured in from inlet 230a inside a sealant 230, it has the cellular structure which it comes to close with a sealing agent 231.
[0025] On the inside (front face which counters the 2nd substrate 221) of the 1st substrate 211, the transparent electrode 216 for the display of the shape of a stripe arranged in parallel is formed, and the transparent electrode 222 for the display of the shape of a stripe arranged in parallel is formed on the inside of the 2nd substrate 221. [two or more] [two or more] Moreover, a transparent electrode 216 is connected conductively to wiring 218A, and the transparent electrode 222 is connected conductively to wiring 228. It intersects perpendicularly mutually, and the intersection field constitutes the pixel of a large number arranged in the shape of a matrix, and, as for a transparent electrode 216 and a transparent electrode 222, these pixel arrays constitute the image display field A.
[0026] The 1st substrate 211 has substrate overhang section 210T which it comes to ****** outside the appearance of the 2nd substrate 221, and above-mentioned wiring 218A, wiring 218B connected conductively through the vertical flow section which consists of a part of sealants 230 to the above-mentioned wiring 228, and the input terminal section 219 which consists of two or more circuit patterns formed independently are formed on these substrate overhang section 210T. Moreover, on substrate overhang section 210T, the semiconductor IC 261 which built in the liquid crystal drive circuit etc. is mounted so that it may be connected conductively to these wiring 218A and 218B and the input terminal section 219. Moreover, the flexible wiring substrate 263 is mounted in the edge of substrate overhang section 210T so that it may be connected conductively to the above-mentioned input terminal section 219.
[0027] Next, with reference to drawing 2 (a) and (b), the structure of the substrate 210 for liquid crystal equipments is explained. It is an outline cross section [in / the X-X' line of (a) / (a), and / in (b)]. / the expansion part plan of liquid crystal equipment 200 The reflecting layer 212 is formed in the front face of the 1st substrate 211. A reflecting layer 212 consists of cascade screens with aluminum, silver, these alloys or aluminum, silver or these alloys, titanium, a titanium nitride and molybdenum, a tantalum, etc., and reflective section 212r which reflects light, and translucent part (opening) 212a which penetrates light are prepared in the reflecting layer 212 for every above-mentioned pixel.
[0028] On the reflecting layer 212, the coloring layer 224 is formed so that translucent part (opening)

212a may be covered superficially, and in reflective section 212r, the coloring layer 225 of two or more dot configurations is formed.
[0029] Usually, into a transparent resin, the coloring layers 224 and 225 shall distribute coloring matters, such as a pigment and a color, and shall present the predetermined color tone. Moreover, with the gestalt of this operation, although the color tone of the coloring layers 224 and 225 consists of combination of three colors of R (red), G (green), and B (blue) as a primary color system filter, it is not limited to this and may consist of three colors of cyanogen, MAZENDA, and yellow. Usually, the coloring layers 224 and 225 which have a predetermined color pattern are formed by applying the coloring resist which consists of a photopolymer containing coloring matters, such as a pigment and a color, on the 1st substrate 211, and removing a garbage by the photolithography method. In forming the coloring layers 224 and 225 of two or more color tones here, it repeats the above-mentioned process.
[0030] Moreover, as for the coloring layer 225 of the dot configuration formed on reflective section 212r, it is desirable that it is 10% - 90% of the area of reflective section 212r, and it is still more desirable that it is 20 - 80%. Thus, without reducing the thickness of the color of the penetrated type display which is usually easy to become thin [a color] by forming the coloring layer 225 in a dot configuration in reflective section 212r, and decreasing the area, only the thickness of the color of a reflected type display can be reduced and the color tone (thickness of a color) of the image display in a penetrated type display can be raised relatively.
[0031] At this time, the portion arranged at reflective section 212r of the portion arranged at transparency section 212a of the coloring layer 224 and the coloring layer 225 can be constituted so that the material of the same optical concentration may be included. Thus, the coloring layers 224 and 225 can be formed by constituting, without making a manufacturing process complicate in any way.
[0032] Here, optical concentration means the capacity per unit thickness of the coloring layer toward which the wavelength distribution of light is biased, if optical concentration is high, the saturation of the transmitted light will become strong (if large), and if optical concentration is low, the saturation of the transmitted light will become small (if small). When the coloring layer contains coloring matters, such as a pigment and a color, this optical concentration usually has the amount of the material which constitutes the coloring layer, and positive correlation.
[0033] Moreover, including the 2nd material, the portion by which the portion arranged at transparency section 212a of the coloring layer 224 is arranged at reflective section 212r of the coloring layer 225 including the 1st material can constitute the 1st material and the 2nd material so that optical concentration may differ mutually. Thus, by constituting, the coloring matter of the coloring layer 225 can be chosen according to the spectral characteristic of outdoor daylight, the reflection property of a reflecting layer 212, etc., the coloring matter of the coloring layer 224 can be chosen according to the spectral characteristic of lighting light etc., and image display excellent in color-reproduction nature can be realized.
[0034] In addition, although the stripe array is adopted in the example of illustration shown in drawing 2 (a) as an array pattern of the coloring layers 224 and 225, various pattern configurations other than this stripe array, such as a delta array and a slanting mosaic array, are employable. Moreover, the black shading film for shading the field between pixels can be formed in the circumference of each coloring layer 225 of R (red), G (green), and B (blue). Moreover, with the gestalt of this operation, each dot configurations of two or more of the coloring layer 225 are arranged so that each may estrange. Thus, by constituting, it is lost that the coloring layer 225 of a dot configuration inclines and is arranged on reflective section 212r, and the reflected type display excellent in contrast can be realized.
[0035] Furthermore, the surface-protection layer 215 which consists of organic resins, such as SiO2, the inorganic material of TiO2 grade or acrylic resin, and an epoxy resin, etc. on the 1st substrate 211 is formed in the whole surface.
[0036] On the surface-protection layer 215, the transparent electrode 216 which consists of transparent conductors, such as ITO (Indium Tin Oxide), is formed. A transparent electrode 216 is formed in band-like [which is prolonged in the illustration vertical direction of drawing 2 (a)], and two or more transparent electrodes 216 arrange it in parallel mutually, and it is constituted in the shape of a stripe. On

the transparent electrode 216, the orientation film 217 which consists of polyimide resin etc. is formed.
[0037] In the gestalt of this operation, while the coloring layer 224 which constitutes a light filter has lapped superficially so that translucent part (opening) 212a of a reflecting layer 212 may be completely covered in each pixel as shown in drawing 2 (a), the coloring layer 225 is arranged on reflective section 212r at a dot configuration, and each dot is arranged irregularly.
[0038] On the other hand, in liquid crystal equipment 200, the substrate 210 for liquid crystal equipments and the opposite substrate 220 which counters carry out the laminating of the same transparent electrode 222 as the above, the hard protective coat 233 which consists of SiO2 or TiO2 grade, and the same orientation film 234 as the above one by one on the 2nd substrate 221. A transparent electrode 222 is formed in band-like [which is prolonged in the illustration longitudinal direction of drawing 2 (a)], and two or more transparent electrodes 222 arrange it in parallel mutually, and it is constituted in the shape of a stripe. The field where a transparent electrode 222 and transparent electrodes 216 overlap turns into a pixel field.
[0039] Moreover, the phase contrast board (1/4 wavelength plate) 240 and a polarizing plate 241 are arranged at the superficies of the 1st substrate 211, and the phase contrast board (1/4 wavelength plate) 250 and the polarizing plate 251 are arranged at the superficies of the 2nd substrate 221.
[0040] In the gestalt of this operation constituted as mentioned above, the outdoor daylight which carried out incidence to reflective section 212r from the opposite substrate 220 side The light which passes the coloring layer 225 arranged at the dot configuration, and is reflected by reflective section 212r on reflective section 212r (henceforth the "coloring reflected light"), It is divided into two kinds of light (henceforth "the colorless reflected light") which passes through the field where the coloring layer 224 is not arranged, and is reflected by reflective section 212r.
[0041] The coloring reflected light passes and carries out outgoing radiation of the coloring layer 225 again, after being reflected by reflective section 212r. Moreover, outgoing radiation of the colorless reflected light is carried out, without passing the coloring layer 225 also at once. By this colorless reflected light and the coloring reflected light being put together, and indicating by the reflected type, compared with the image display of only the conventional coloring reflected light, a color tone (thickness of a color) can be reduced moderately and the luminosity of image display can be raised.
[0042] Moreover, since the coloring layer 224 had covered all translucent part (opening) 212a of a reflecting layer 212, when the back light etc. is arranged behind liquid crystal equipment 200 and lighting light is irradiated from behind, for example, the lighting light which carried out incidence to translucent part (opening) 212a passes the coloring layer 224, liquid crystal 223, and the opposite substrate 220, and realizes image display. Thus, in order that the transmitted light may pass the coloring layer 224 only once, the color of the penetrated type display according to the depth of shade (degree which gives a bias to the spectrum distribution of a light field when light is made to penetrate) of the coloring layer 224 is acquired. Since the reflected light component which does not pass the coloring layer 225 of a dot configuration as mentioned above is contained and the color tone (thickness of a color) of the reflected light falls at this time, the color tone (thickness of a color) of a penetrated type display will increase relatively.
[0043] With reference to [the gestalt of the 2nd operation] next drawing 3 (a), and (b), the gestalt of operation of the 2nd of this invention is explained. (a) is an outline cross section [in / the Y-Y' line of (a) / in the expansion part plan of the liquid crystal equipment 300 which is the gestalt of the 2nd operation, and (b)]. In the liquid crystal equipment 300 of the gestalt of this operation, since it has the 1st same substrate 311 as the gestalt of the 1st operation of a ****, the 2nd substrate 321, the coloring layer 324, the coloring layer 325 of a dot configuration, the surface-protection layer 315, a transparent electrode 316, the orientation film 317, a transparent electrode 322, the hard protective coat 333, the orientation film 334, a sealant 330, liquid crystal 323, the phase contrast board 340,350, and the polarizing plate 341,351, explanation is omitted about these
[0044] It is [in the image display field A (refer to drawing 1)] almost extensively united, as for liquid crystal equipment 300, the reflecting layer 312 is formed, and translucent part (opening) 312a is prepared for every pixel. It is reflective section 312r in which portions other than translucent part

(opening) 312a reflect light substantially among this reflecting layer 312. Moreover, black shading film 324BM which consists of a black resin etc. is formed in the field between pixels. The thing which distributed coloring matters, such as a black pigment and a color, in the transparent resin as a black resin, or the thing which was made to mix both the coloring matters of three colors of R (red), G (green), and B (blue), and was distributed in the transparent resin is used.

[0045] With the gestalt of this operation, although the reflecting layer 312 should be continued for two or more pixels and it should be formed in one, a reflecting layer 212 may be formed for every pixel like the gestalt of the 1st operation shown in drawing 2 , and a black shading film may be formed between reflecting layers.

[0046] While raising the luminosity of image display [in / a reflected type / like / the gestalt of the 2nd operation / the gestalt of the 1st operation of a ****] constituted as mentioned above, the difference in the color in the image display of both a reflected type and a penetrated type can be reduced by raising relatively the color tone (thickness of a color) of the image display in a penetrated type.

[0047] With reference to [the gestalt of the 3rd operation] next drawing 4 (a), and (b), the gestalt of operation of the 3rd of this invention is explained. (a) is an outline cross section [in / the Z-Z' line of (a) / in the expansion part plan of the liquid crystal equipment 400 which is the gestalt of the 3rd operation, and (b)]. In the liquid crystal equipment 400 of the gestalt of this operation, since it has the 1st same substrate 411 as the gestalt of the 2nd operation of a ****, the 2nd substrate 421, the reflecting layer 412 that has translucent part (opening) 412a and reflective section 412r, the surface-protection layer 415, a transparent electrode 416, the orientation film 417, a transparent electrode 422, a sealant 430, liquid crystal 423, the phase contrast board 440,450, and the polarizing plate 441,451, explanation is omitted about these.

[0048] In the form of this operation, as shown in drawing 4 (b), the coloring layer 424, the coloring layer 425 of a dot configuration, and black shading film 424BM are formed not on the 1st substrate 411 in which the reflecting layer 412 was formed but on the 2nd substrate 421. the field specifically corresponding to [in the coloring layer 424 / the whole pixel] translucent part (opening) 412a in the 2nd substrate 421 top -- alike -- a wrap -- it needs -- it is formed and the coloring layer 425 of a dot configuration is formed in the field corresponding to reflective section 412r The same black shading film 424BM as what was used in the form of the 2nd operation of a **** is formed in the field between pixels. The transparent surface-protection layer 426 is formed on the coloring layer 424, the coloring layer 425 of a dot configuration, and black shading film 424BM.

[0049] A transparent electrode 422 is formed on the surface-protection layer 426, and the hard protective coat 433 and the orientation film 434 are formed one by one on this transparent electrode 422.

[0050] If the superficial lap mode with a reflecting layer 412, the coloring layer 424, and the coloring layer 425 of a dot configuration is constituted as mentioned above even if formed on the substrate from which a reflecting layer 412, and the coloring layer 424 and the coloring layer 425 of a dot configuration differ like the gestalt of this operation, the same operation effect as the gestalt of the 1st operation and the gestalt of the 2nd operation can be done so.

[0051] With reference to [the other examples of composition], next drawing 5 (a) - (d), the example of composition of others applicable to the gestalt of each above-mentioned implementation is explained. Each example of composition explained below illustrates and explains only the superficial physical relationship of a reflecting layer and a coloring layer.

[0052] Coloring layer 524r which presents the hue of R (red) to the field corresponding to translucent part (opening) 512a on a reflecting layer 512 in each pixel in the example 1 of composition shown in drawing 5 (a), Coloring layer 525r of the dot configuration which is formed so that 524g of coloring layers which present the hue of G (green), and coloring layer 524b which presents the hue of B (blue) may lap superficially, respectively, and presents the hue of R (red) on reflective section 524r, Coloring layer 525b of the dot configuration which presents 525g of coloring layers of the dot configuration which presents the hue of G (green), and the hue of B (blue) is formed. In this example of composition, on reflective section 512r, it is arranged so that the coloring layers 524r, 524g, and 524b in each pixel may cover translucent part (opening) 512a completely, respectively, and the coloring layers 525r, 525g,

and 525b are arranged at a dot configuration, and at least two of each dot configurations are arranged so that it may touch. Thus, by constituting, each area of the coloring layer 525 on reflective section 512r becomes large, and can make firm junction in a reflecting layer 512 and the coloring layer 525.
[0053] In the example 2 of composition shown in drawing 5 (b), it is constituted so that the coloring layers 624r, 624g, and 624b in each pixel may cover translucent part (opening) 612a completely, respectively, and it is arranged so that it may jut out of the field which laps with translucent part (opening) 612a superficially over the field which laps with surrounding reflective section 612r superficially. Moreover, the coloring layers 625r, 625g, and 625b of a dot configuration are arranged at random at reflective section 612r. Thus, in the manufacture method which used the ink-jet method, the constituted coloring layers 625r, 625g, and 625b can simplify control of a nozzle etc., and can form it easily.
[0054] In the example 3 of composition shown in drawing 5 (c), it is constituted so that the coloring layers 724r, 724g, and 724b in each pixel may cover translucent part (opening) 712a completely, respectively, and it is arranged to the field which laps with surrounding reflective section 712r superficially from the field which laps with translucent part (opening) 712a superficially. Moreover, it is arranged at reflective section 712r so that the coloring layers 725r, 725g, and 725b of a dot configuration may arrange along the direction of the illustration four directions of drawing 5 (c). Thus, by arranging equally the coloring layers 725r, 725g, and 725b, it becomes easy to manage the saturation of reflected type image display, and image display which was excellent at color-reproduction nature can be realized.
[0055] In the example 4 of composition shown in drawing 5 (d), it is constituted so that the coloring layers 824r, 824g, and 824b in each pixel may cover translucent part (opening) 812a completely, respectively, and it is arranged to the field which laps with surrounding reflective section 812r superficially from the field which laps with translucent part (opening) 812a superficially. Moreover, the coloring layers 825r, 825g, and 825b of a dot configuration form a square dot configuration in reflective section 812r, and are arranged at it. Although the dot configuration is formed in a square in the example 4 of composition, you may be other polygons and ellipse forms. Since the formation is easy for such coloring layers 825r, 825g, and 825b of a configuration, they can realize shortening of production time, and improvement in the yield.
[0056] With reference to the [manufacture method of the substrate for electro-optics equipments], next drawing 6 (a) - (f), the manufacture method of the substrate for electro-optics equipments of this invention is explained taking the case of the manufacture method of the substrate for liquid crystal equipments.
[0057] Drawing 6 (a) - (f) is the outline cross section showing the manufacturing process for forming the substrate 910 for liquid crystal equipments in order of a process. As shown in drawing 6 (a), on the substrates 911, such as glass [which defecated by ultrasonic cleaning etc.], aluminum, silver, these alloys or aluminum, silver, or these alloys, A cascade screen with titanium, a titanium nitride, molybdenum, a tantalum, etc. by the vacuum deposition, the sputtering method, etc. The reflecting layer 912 which has translucent part (opening) 912a and reflective section 912r for every pixel is formed by forming membranes with a thickness of 50nm - about 250nm in the shape of a thin film, and carrying out patterning of this using the well-known photolithography method.
[0058] Next, as shown in drawing 6 (b), coloring layer 924R which consists of photopolymers, such as a photosensitive resist of R (red), a pigment resist, or acrylic resin, is formed by the spin coat method etc. on the front face of a substrate 911.
[0059] Next, as shown in drawing 6 (c), coloring layer 924R on a substrate 911 is exposed using the resist mask 950 which has a predetermined pattern. Although a negative type and positive type any may be used as a photopolymer of coloring layer 924R, the negative type case is illustrated as a photopolymer, and as the excessive portion of coloring layer 924R is protected with the resist mask 950 to drawing 6 (c), ultraviolet rays are irradiated at it.
[0060] Next, as shown in drawing 6 (d), coloring layer 924of R (red) R is developed, coloring layer 924r is formed so that translucent part (opening) 912a of a reflecting layer 912 may be covered superficially, and coloring layer 925r of a dot configuration is formed in reflective section 912r of a reflecting layer

912.
[0061] Next, instead of coloring layer 924of R (red) R, the coloring layer of G (green) is used and the process to above drawing 6 (a) - (d) is repeated next using the coloring layer of B (blue). As shown in drawing 6 (e), by doing in this way Coloring layer 924r of R (red), It is formed so that 924g of coloring layers of G (green) and coloring layer 924of B (blue) b may cover translucent part (opening) 912a. Coloring layer 925b of coloring layer 925r of the dot configuration of R (red), 925g of coloring layers of the dot configuration of G (green), and the dot configuration of B (blue) is formed on reflective section 912r.
[0062] Next, as shown in drawing 6 (f), on a substrate 911, the surface-protection layer 915 which consists of organic resins, such as SiO2, the inorganic material of TiO2 grade or acrylic resin, and an epoxy resin, etc. is formed in the whole surface, and patterning of the transparent electrode 916 which consists of transparent conductors, such as ITO, on the surface-protection layer 915 is formed and carried out. On a transparent electrode 916, the orientation film 917 which consists of polyimide resin etc. is formed.
[0063] Although the case where coloring layer 924of R (red) R is formed first is illustrated in drawing 6 , you may form from the coloring layer of G (green) or B (blue). Moreover, three colors which form a coloring layer may be three colors of R (red), G (green), and not only B (blue) but cyanogen, MAZENDA, and yellow. The black shading film which consists of a black resin etc. may be formed in the field between each pixel of the coloring layers 925r, 925g, and 925b. moreover, as a black resin The thing which distributed coloring matters, such as a black pigment and a color, in the transparent resin, or the thing which was made to mix both the coloring matters of three colors of R (red), G (green), and B (blue), and was distributed in the transparent resin can be used.
[0064] Moreover, coloring layer material can be applied to reflective section 912r from the nozzle which can be scanned in the predetermined direction as a substitute of exposure of drawing 6 (b) and (c), and the process of development, and two or more coloring layers 925 can also be formed in a dot configuration at reflective section 912r. Specifically, you may form the coloring layers 924r, 924g, 924b, 925r, 925g, and 925b using an ink-jet method. For example, moving an ink-jet head and making the front face of a substrate 911 scan, you breathe out the coloring layer material of R (red) from the nozzle prepared in the ink-jet head to the predetermined timing corresponding to the pattern, and make it adhere on a substrate 911, in forming the coloring layers 924r and 925r of R (red). And coloring layer material is dried and solidified by **** processing, UV irradiation processing, or vacuum-drying processing, and the coloring layers 924r and 925r of R (red) are formed. The remaining coloring layers 924g, 924b, 925g, and 925b are formed by repeating this processing for every color. Thereby, the coloring layer of a desired color tone (thickness of a color) can be formed.
[0065] When using an ink-jet method, the scan of an ink-jet head is repeated for every color. In addition, coloring layer 924r, 924g, 924b, 925r, 925g, and 925b may be formed, the nozzle of three colors of R (red), G (green), and B (blue) is arranged on one ink-jet head, and three colors of R (red), G (green), and B (blue) may be simultaneously formed by one scan.
[0066] As an example of the ink-jet method, a piezo-electric element method, the method using heat energy, etc. can be used anything, for example. However, it is desirable to carry out the regurgitation of the fluid of 50 or less pls in the regurgitation precision of less than **30 micrometers.
[0067] With reference to [Modification(s)], next drawing 7 (a) - (c) and drawing 8 (a) - (c), a modification applicable to the gestalt of each above-mentioned implementation is explained. Each modification explained below illustrates and explains only the superficial physical relationship of a reflecting layer and a coloring layer.
[0068] The modification 1 shown in drawing 7 (a) is formed of the color material from which the coloring layers 1024r, 1024g, and 1024b formed in translucent part (opening) 1012a of a reflecting layer 1012 and the coloring layers 1025r, 1025g, and 1025b of the dot configuration formed in reflective section 1012r differ. Thus, by constituting, the color material doubled with each property of a reflected type display and a penetrated type display can be chosen, and contrast can be raised.
[0069] The coloring layers 1125r, 1125g, and 1125b of a dot configuration are formed all over the total

reflection type reflecting layer 1112 in which the modification 2 shown in drawing 7 (b) does not have a translucent part (opening). Thus, by constituting, a luminosity can be raised in the total reflection type electro-optics equipment which is usually easy to become dark.
[0070] The modification 3 shown in drawing 7 (c) is formed so that the ratio of the gross area for every pixel of the coloring layers 1225r, 1225g, and 1225b of the dot configuration formed on reflective section 1212r of a reflecting layer 1212 may be differed. The area of the coloring layers 1224r, 1224g, and 1224b on translucent part (opening) 121a is formed so that it may become the same.
[0071] Usually, the spectral characteristic of the reflection factor of a reflecting layer 1212 has the property that a reflection factor falls gradually as wavelength becomes short, when making silver or a silver alloy into a principal component. Thereby, although image display will wear yellow on the whole, by making small the rate of surface ratio of the coloring layers 1225b, 1225g, and 1225r at order of B (blue), G (green), and R (red) with short wavelength like a modification 3 for example, coloring yellow is amended at blueness, the white display of it is attained, and image display which was excellent at the white balance can be realized.
[0072] The coloring layers 1324r, 1324g, and 1324b are formed on translucent part (opening) 1312a in which translucent part (opening) 1312a of a reflecting layer 1312 was alternately formed in, and the modification 4 shown in drawing 8 (a) was formed alternately, and the coloring layers 1325r, 1325g, and 1325b of a dot configuration are formed on reflective section 1312r of a reflecting layer 1312.
[0073] Reflective section 1412r is formed so that translucent part (opening) 1412a of a reflecting layer 1412 may be formed in the both sides of a reflecting layer 1412 band-like (side slit) and the modification 5 shown in drawing 8 (b) may be inserted into translucent part (opening) 1412a. On translucent part (opening) 1412a, the coloring layers 1424r, 1424g, and 1424b are formed, and the coloring layers 1425r, 1425g, and 1425b of a dot configuration are formed on reflective section 1412r.
[0074] Translucent part (opening) 1512a of a reflecting layer 1512 is formed in the four corners of a reflecting layer 1512, and, as for the modification 5 shown in drawing 8 (c), reflective section 1512r is formed in the cross-joint type. On translucent part (opening) 1512a, the coloring layers 1524r, 1524g, and 1524b are formed, and the coloring layers 1525r, 1525g, and 1525b of a dot configuration are formed on cross-joint type reflective section 1512r.
[0075] [The form of operation of electronic equipment], next the form of the operation of electronic equipment which used for the display the liquid crystal equipment explained until now are explained. Drawing 9 is the outline block diagram showing the whole form composition of this operation. The electronic equipment shown here has the same liquid crystal equipment 200 as the above, and the control means 1600 which control this. Here, liquid crystal equipment 200 is notionally divided into panel structure 200A and drive circuit 200B which consists of semiconductor ICs etc., and it has drawn. Moreover, control means 1600 have the source 1610 of a display information output, the display-processing circuit 1620, a power circuit 1630, and a timing generator 1640.
[0076] The source 1610 of a display information output is equipped with the memory which consists of a ROM (Read Only Memory), RAM (Random Access Memory), etc., the storage unit which consists of a magnetic-recording disk, an optical recording disk, etc., and the tuning circuit which carries out the alignment output of the digital image signal, and based on various kinds of clock signals generated by the timing generator 1640, it is constituted so that display information may be supplied to the display information processing circuit 1620 in forms, such as a picture signal of a predetermined format
[0077] The display information processing circuit 1620 performs processing of display information in which had various well-known circuits, such as a serial-parallel conversion circuit, amplification and an inverter circuit, a rotation circuit, a gamma correction circuit, and a clamping circuit, and it inputted, and supplies the image information to drive circuit 200B with a clock signal CLK. Drive circuit 200B includes a scanning-line drive circuit, a data-line drive circuit, and an inspection circuit. Moreover, a power circuit 1630 supplies predetermined voltage to each above-mentioned component, respectively.
[0078] Drawing 10 is the perspective diagram showing the portable telephone which is an example in the form of this operation. The circuit board 2001 is arranged inside the case object 2010, and, as for this portable telephone 2000, above-mentioned liquid crystal equipment 200 is mounted to this circuit board

2001. The operation button 2020 is arranged and the antenna 2030 is attached in the front face of the case object 2010 free [frequent appearance] from the end section. A loudspeaker is arranged inside the receiver section 2040 and the microphone is built in the interior of the transmission section 2050.
[0079] The liquid crystal equipment 200 installed in the case object 2010 is constituted so that the screen (image display field A (refer to drawing 1)) can be checked by looking through a display window 2060.
[0080] In addition, the electro-optics equipment of this invention of the ability of change to be variously added within limits which are not limited only to the above-mentioned example of illustration, and do not deviate from the summary of this invention is natural. For example, although the electro-optics equipment shown in the form of each above-mentioned implementation is equipped with simple matrix type structure, it is applicable also to the electro-optics equipment of an active matrix using active elements (active element), such as a TFT (TFT) element and a TFD (thin film diode) element. Moreover, although the liquid crystal equipment of the form of each above-mentioned implementation has the so-called COG type of structure, it may be constituted so that a flexible wiring substrate and a TAB substrate may be connected to the liquid crystal equipment which is not the structure of mounting IC chip directly, for example, liquid crystal equipment. Furthermore, you may apply this invention to the electro-optics equipment using the electrooptic materials, for example, EL light emitting device etc., other than liquid crystal etc.
[0081]
[Effect of the Invention] As mentioned above, while raising the luminosity of the image display in a reflected type according to this invention when used for the electro-optics equipment in electronic equipment, such as a portable telephone and a carried type personal computer, as explained The color tone (thickness of a color) of the image display in a penetrated type can be raised relatively, and the substrate for electro-optics equipments which can reduce the difference in the color in the image display of both a reflected type and a penetrated type and its manufacture method, electro-optics equipment, and electronic equipment can be offered.

[Translation done.]